

## **REMARKS**

Claims 10-27 are pending in the application. By this Amendment, claims 10 and 12 have been amended, and claims 22-27 have been newly added. No new matter has been entered.

As a formal matter, Applicants note that the final Office Action dated December 29, 2004 indicates that none of the copies of the certified copies of the priority documents have been received from the International Bureau. The indication is, however, contrary to the previous Office Action dated July 1, 2003, in which the receipt of such copies was acknowledged. Therefore, Applicants respectfully request that the Examiner clarify this matter in the next Office communication to Applicants.

In the Office Action dated December 29, 2004, claims 10-21 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Robb (U.S. Pat. No. 4,529,860) in view of so-called "Admitted Prior Art." In view of the reasons explained below, Applicants respectfully request reconsideration and withdrawal of this rejection.

Each of independent claims 10 and 12 is drawn to a combination of method steps that is patentable over the asserted combination of Robb and the alleged Admitted Prior Art. For example, independent claim 10 recites a method of etching an organic film, comprising, among other things, "pressurizing the process chamber to a pressure equal to or higher than 500 mTorr," "etching the organic film so as to form a ditch having a smooth bottom surface while substantially preventing a micro trench," "stopping the etching before the ditch goes through the organic film," and "ending the etching process." Similarly, independent claim 12 recites a method of etching an organic film comprising, among other things, "pressurizing the process chamber to a pressure between 500 - 800 mTorr," "etching the organic film so as to form a ditch

having a smooth bottom surface while substantially preventing a micro trench,” “stopping the etching before the ditch goes through the organic film,” and “ending the etching process.” As detailed below, neither Robb nor the alleged Admitted Prior Art, taken either alone or in combination, discloses or suggests the above-mentioned method steps of claims 10 and 12.

Robb discloses a method of anisotropically etching an organic material with an overlying patterning mask for reducing mask undercutting. Robb, however, does not disclose any method having all the claimed steps, including a step of “pressurizing the process chamber to a pressure equal to or higher than 500 mTorr” or “between 500 - 800 mTorr,” as recited in claims 10 and 12, respectively. Instead, the method of Robb teaches a pressure ranging from about 13.3 Pa (=97.8 mTorr) to about 53 Pa (=398.8 mTorr).

Nonetheless, the Examiner asserts that

Robb ... teaches that a range of up to 500 mTorr (66.5 Pa, col. 1, lines 26-28) is known. Robb also teaches that high pressure etching of polyimide is also known (col. 1, lines 21-22), which presumably encompasses pressures greater than 500 mTorr, however at higher pressure later etching becomes more pronounced. Robb therefore teaches that the pressure is a result effective variable. [See Page 3 of the Office Action.]

Applicants respectfully disagree with the Examiner’s assertion. For example, the only stated reason for parametrically varying the pressure in Robb from 13 Pa (=97.8 mTorr) to 66.5 Pa (498.8 mTorr) is to measure the etch rate and anisotropy of undercutting. See, e.g., col. 4, lines 26-29. Robb then concludes that at pressures greater than about 53 Pa, a significant mask undercutting is observed and, therefore, the pressure should be maintained below 53 Pa (where anisotropic processes

dominate) for an anisotropic etching. See, e.g., col. 5, lines 2-31. Thus, pressurizing a process chamber above about 53 Pa (399 mTorr), as asserted by the Examiner, would teach against the explicit teachings of Robb.

Worth noting is the Examiner's continued assertion, relying on col. 1, lines 21-22, of Robb, that Robb "presumably encompasses pressure greater than 500 mTorr." Contrary to the Examiner's assertion, col. 1, lines 21-23, of Robb merely state that "[c]urrent wet chemical as well as high pressure plasma etch processes for polyimide, however, produce lateral etching which, at best, is proportional to the vertical etch depth." As is apparent, there is absolutely nothing in this text that suggests the "high pressure" encompasses a pressure greater than 500 mTorr, as asserted by the Examiner. Moreover, nothing in Robb suggests using a high pressure plasma etch process. On the contrary, Robb teaches against the use of such a high pressure plasma etch process due to its lateral etching problem. Therefore, the Examiner's assertion that Robb "presumably encompasses pressure greater than 500 mTorr" cannot be supported and must be withdrawn.

Furthermore, without providing sufficient answer to the substance of the Applicants' remarks filed on September 29, 2003, the Examiner continues to assert that Robb teaches a result-effective variable (i.e., pressure) because "[v]arying pressure varies the results." Applicant again respectfully disagrees with this allegation.

According to MPEP § 707.07(f) (8<sup>th</sup> Edit.), "[w]here the applicant traverses any rejection, the examiner should, if he or she repeats the rejection, take note of the applicant's arguments and answer the substance of it." Notwithstanding this procedure, the Examiner continues to ignore the well-settled law with respect to a result-effective

variable and continues to assert unsupported opinions. For example, the fact that varying pressure varies the results does not automatically qualify the variable as a result-effective variable. Presumably, any given variable, as a matter of laws of nature, affects in one way or another some results. For example, a pressure always affects temperature. At any given condition, a change in pressure almost always changes temperature, yet it is incorrect and illogical to assume that a pressure is always a result-effective variable. With respect to defining a result-effective variable, M.P.E.P.

§ 2144.05 II.B provides the following specific guidelines:

“[a] particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation.” (Emphasis supplied by Applicants).

That is, in order for a variable disclosed in a prior art reference to be considered as a result-effective variable (which can arguably be optimized to meet the claimed range), the result Applicants obtain with the claimed variable range must necessarily be recognized from the disclosure in the prior art reference, so that the optimum or workable ranges of the variable can be obtained via routine experimentation. If, on the other hand, the result Applicants obtain with the claimed range of the variable were different from, or not recognized by using the disclosure of the prior art reference, the teachings of the prior art reference cannot possibly obtain the same optimum or workable ranges of the variable through routine experimentation, because the prior art teaching would most likely arrive at a result distinctly different from that of the Applicant's claimed invention.

In this case, Applicants are attempting to obtain a ditch (e.g., a contact hole) having a flat shape. To do so, Applicants, among other things, pressurize the process chamber to the claimed range (i.e.,  $\geq 500$  mTorr or  $500 \sim 800$  mTorr) as the optimum pressure range for obtaining the flat shape of the contact holes. Therefore, in order for the pressure in Robb to be considered as a result-effective variable and thereby be optimized to meet the claimed pressure ranges, Robb must have necessarily attempted to obtain the same result as that of Applicants' or at least recognized the result which Applicants' are attempting to achieve. Robb, however, neither attempts to obtain the same result as that of Applicants nor recognizes the result obtained. Instead, Robb merely varies the pressure parametrically to measure etch rate and anisotropy of mask undercutting at different pressures. Not surprisingly, Robb then determines that the optimal pressure range is between 13 Pa (=97.8 mTorr) and 53 Pa (=398.8 mTorr), i.e., different from the Applicants' claimed range.

For at least this reason, Applicants respectfully submit that the pressure disclosed in Robb cannot qualify as a result-effective variable. Therefore, one of ordinary skill in the art would not have arrived at Applicants' claimed pressure range through routine experimentation based on the disclosure of Robb.

Moreover, in response to Applicants' remarks filed on September 29, 2004, the Examiner asserts that "when taken to one significant digit, 498 mTorr is about 500 mTorr." Applicants respectfully traverse this reasoning.

The Examiner appears to suggest that, since the claimed value of 500 mTorr has one significant digit, the value of 498 mTorr should be rounded to 500 mTorr with one significant digit. This reasoning is flawed because, even if the value in Robb was 451

mTorr instead of 498 mTorr, the value of 451 mTorr would be considered to be the same as the claimed value of 500 mTorr because 451 mTorr may be rounded to 500 mTorr. Applicants respectfully submit that a skilled practitioner in the scientific community knows that when a value in a unit is converted to another unit, the number of significant digits should remain the same. That is, since the original value disclosed in Robb is 66.5 Pa with three significant digits, if 66.5 Pa is to be converted to a value in “mTorr”, 66.5 Pa should be converted to 499 mTorr with three significant digits, rather than comparing the significant digits to the value to be merely compared.

Applicants respectfully submit that the claimed value of 500 mTorr or 500-800 mTorr plainly suggests that the processing chamber is pressurized to a pressure of 500 mTorr or to a pressure range of 500-800 mTorr, without making any reference to its number of significant digits or the proximity of the value. Therefore, the Examiner’s consideration of significant digits in the claimed values is improper and erroneous. Consequently, Robb fails to teach or suggest the claimed value of 500 mTorr.

At least for the reasons set forth above, independent claims 10 and 12 are patentably distinguishable from Robb and the other cited prior art references. Accordingly, Applicants respectfully request reconsideration of this application, withdrawal of the rejection under 35 U.S.C. § 103(a), and timely allowance of all pending claims.


The final Office Action contains a number of statements and characterizations regarding the claims and the related art. Applicants decline to subscribe to any statement or characterization in the final Office Action, regardless of whether it is addressed above.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

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Dated: March 29, 2004

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